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BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT

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Classification (Cancelled) (Changed to _____)
By authority of Joint Chiefs of Staff (Action 18 Apr 42)
By *John S. Mustin* Date *24 April 51*

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OPERATION CROSSROADS

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DIRECTOR OF SHIP MATERIALS

JOINT TASK FORCE ONE

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BUREAU OF SHIPS GROUP
TECHNICAL INSPECTION REPORT

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By Authority of Joint Chiefs of Staff (Action 18 Apr 49)

John E. Eggers Jr. Date *24 April 51*
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U. S. GOVERNMENT
FROM DOD, U.S.

Intelligence Support Agency
Washington, D. C. 20301

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F.X. Forest,
Captain, U.S.N.

USS MUSTIN (DD413)

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USS MUSTIN (DD413)

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U.S.S. MUSTIN (DD413)

SHIP CHARACTERISTICS

Building Yard: NewPort News Shipbuilding and Dry-dock Company.

Commissioned: 15 September 1939.

HULL

Length Overall: 348 feet 4 inches.

Length on Waterline: 341 feet 0 inches.

Beam (extreme): 36 feet 0 inches.

Depth (molded at side, to main deck, amidships):
19 feet 7 7/8 inches,

Drafts at time of test: Fwd. 12 feet 0 inches.
Aft. 11 feet 6 inches.

Standard displacement: 1,570 tons.

Displacement at time of test: 2,040 tons.

MAIN PROPULSION PLANT

Main Engines: Two sets of Westinghouse turbines are installed, one set per shaft.

Reduction Gears: Two sets of De Laval (Westinghouse Mfg'd.) double reduction are installed, one per shaft.

Main Condensers: Two are installed in ship.

Boilers: Three Babcock and Wilcox boilers are installed in ship. 565 psi gauge. 715° F.

Propellers: Two are installed in ship.

Main Shafts: Two are installed in ship.

Ships Service Generators: Four sets are installed in ship. Two 150 KW.-A.C. and two 40 KW.- D.C. sets.

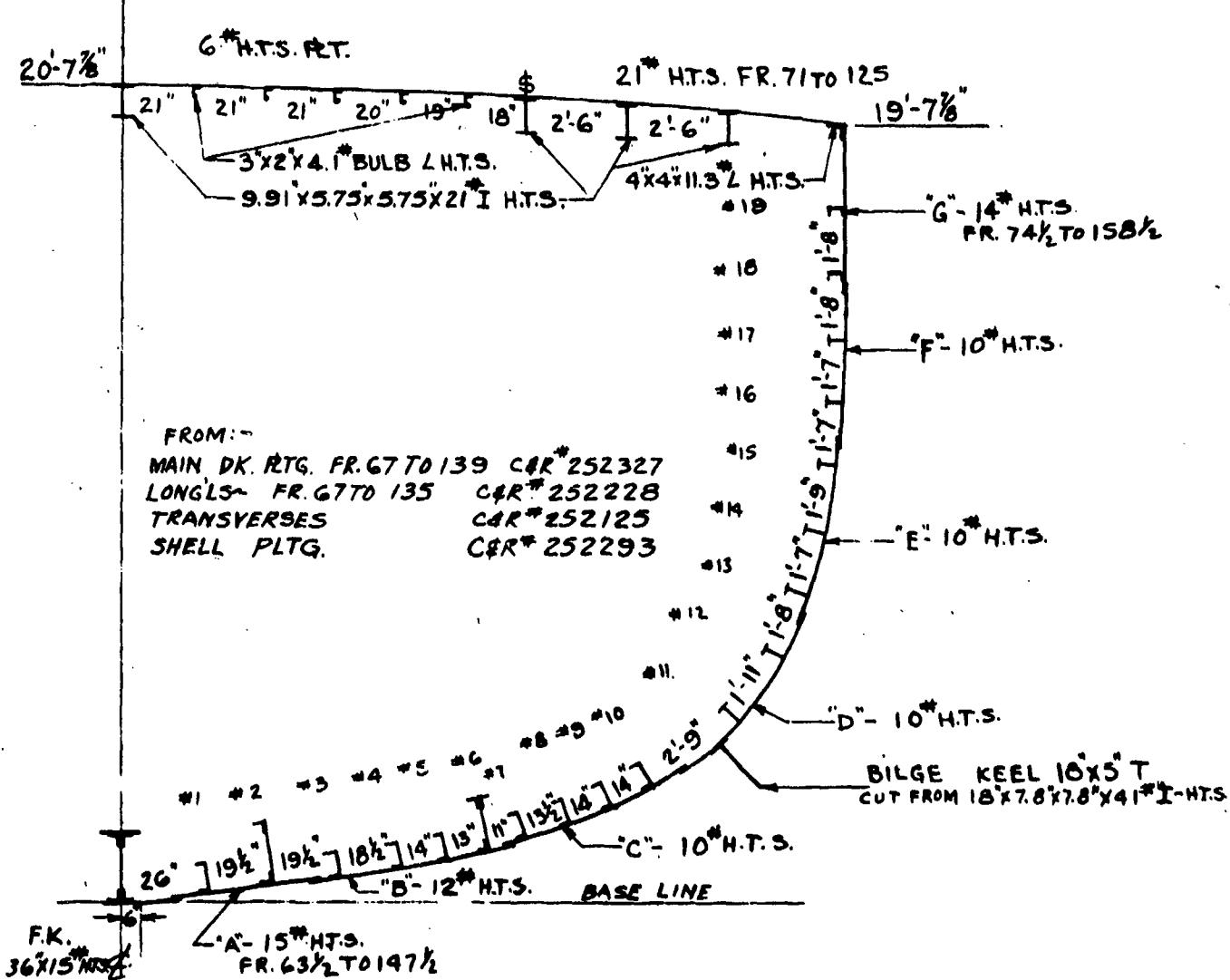
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C.V.K. 2¹/₂"x12" H.T.S. R
 " F.P. 12"x12" H.T.S. R
 " L's 3'x3" I¹" H.T.S. DBL T & B.
 LONG'L 1-9" x 2¹/₂" x 2¹/₂" x 13.4" C H.T.S.
 " 2" 19¹/₂" x 10" RT. 2¹/₂"x3" x 4.5" L H.T.S.
 LONG'L 3.4.5 - 8" x 2¹/₂" x 2¹/₂" x 11.5" L's H.T.S.
 " G - 16³/₄" x 10" R 3'x2¹/₂" x 4.5" L's H.T.S.
 " 7-8-9-10 - 8" x 2¹/₂" x 2¹/₂" x 11.5" C H.T.S.

LONG'L 11-12-13-14 - 6" x 3.06" x 5.87" T-H.T.S.
 " 15-16-17 - 5" x 2.69" x 4.48" T-H.T.S.
 " 18-19 - 5" x 1¹/₄" x 1¹/₄" x 6.7" L's H.T.S.
 7" KEEL BKT EACH FRAME
 7.65" WEBS SPACED 63"



MIDSHIP SECTION FR 98

TEST A

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U.S.S. MUSTIN (DD 413)

TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

There was no flooding, hence no change in drafts or list.

- (b) Structural damage.

HULL

None.

MACHINERY

No comment.

ELECTRICAL

Not observed.

- (c) Other damage.

HULL

No damage occurred to propulsion or other machinery.

MACHINERY

There was no damage to machinery during test A.

ELECTRICAL

None.

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USS MUSTIN (DD413)

II. Forces Evidenced and Effects Noted.

(a) Heat.

HULL

The explosion bore approximately 186 degrees relative. Exposed transverse bulkheads facing aft suffered moderate scorching and blistering of paint.

MACHINERY

No evidence.

ELECTRICAL

The sole evidence of heat was the slight blistering of painted surfaces exposed directly to the blast. This blistering was not great enough to affect in anyway the electrical cable and equipment exposed.

(b) Fires and explosions.

HULL

None.

MACHINERY

No evidence.

ELECTRICAL

There were no fires or explosions.

(c) Shock.

HULL

No effects noted.

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USS MUSTIN (DD413)

MACHINERY

No evidence.

ELECTRICAL

There was no evidence of shock in any electrical equipment.

(d) Pressure.

HULL

The port and starboard flag bags are dished approximately one inch. A ventilation duct seam opened in the electrical workshop, B-103-E.

MACHINERY

No evidence.

ELECTRICAL

There is no evidence of pressure.

(e) Effects peculiar to the atom bomb.

HULL

None, except that of radioactivity.

MACHINERY

None.

ELECTRICAL

None.

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III. Results of Test on Target.

(a) Effect on machinery, electrical, and ship control.

HULL

None.

MACHINERY

Test A had no effect on machinery, and had no effect on ship control insofar as machinery is concerned.

ELECTRICAL

No effect noted by inspection and operation.

(b) Effect on gunnery and fire control.

HULL

None.

MACHINERY

No comment.

ELECTRICAL

None.

(c) Effect on watertight integrity and stability.

HULL

None.

MACHINERY

No comment.

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USS MUSTIN (DD413)

ELECTRICAL

None.

- (d) Effect on personnel and habitability.

HULL

Habitability is unaffected. Personnel in exposed topside locations probably would have suffered burns and temporary blindness.

MACHINERY

Test A would have had no effect on personnel below decks. It had no effect on habitability insofar as machinery is concerned.

ELECTRICAL

None.

- (e) Effect on fighting efficiency.

HULL

None, except through possible injury to topside personnel in exposed positions.

MACHINERY

None.

ELECTRICAL

None.

IV. General Summary of Observers' Impressions and Conclusions.

HULL

This ship was outside of the structural damage range but within the probable personnel injury range.

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MACHINERY

The MUSTIN was outside the effective range of the explosion in test A.

ELECTRICAL

The vessel was located too far out from the point of explosion to receive sufficient damage.

V. Preliminary Recommendations.

HULL

No comment.

MACHINERY

None.

ELECTRICAL

No recommendations are made.

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TECHNICAL INSPECTION REPORT

SECTION I - HULL

GENERAL SUMMARY OF HULL DAMAGE

I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

There was no flooding, hence no change in drafts or list.

- (b) Structural damage.

None.

- (c) Other damage.

No damage occurred to propulsion or other machinery.

II. Forces Evidenced and Effects Noted.

- (a) Heat.

The explosion bore approximately 186° relative. Exposed transverse bulkheads facing aft suffered moderate scorching and blistering of paint.

- (b) Fires and explosions.

None.

- (c) Shock.

No effects noted.

- (d) Pressure.

The port and starboard flag bags are dished

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USS MUSTIN (DD413)

approximately one inch. A ventilation duct seam opened in the electrical workshop, B-103-E.

(e) Effects apparently peculiar to the atom bomb.

None, except that of radioactivity.

III. Effects of Damage:

(a) Effect on machinery, electrical and ship control.

None.

(b) Effect on gunnery and fire control.

None.

(c) Effect on water-tight integrity and stability.

None.

(d) Effect on personnel and habitability.

Habitability is unaffected. Personnel in exposed topside locations probably would have suffered burns and temporary blindness.

(e) Effect on fighting efficiency.

None, except through possible injury to topside personnel in exposed positions.

IV. General Summary of Observers' Impressions and Conclusions.

This ship was outside of the structural damage range but within the probable personnel injury range.

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V. Preliminary General or Specific Recommendations of Inspection Group.

No comment.

VI. Instructions for loading the vessel specified the following:

ITEM	LOADING
Fuel Oil	Minimum
Diesel Oil	Minimum
Ammunition	10%
Potable and reserve feed water	Full Load
Salt water ballast	320 Tons

Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the ship's force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

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DETAILED DESCRIPTION OF HULL DAMAGE

A. General Description of Hull Damage.

No structural damage occurred in this ship.

No damage was sustained by propulsion or other machinery. General views of the exterior and paint damaged are shown on pages 30 to 34 inclusive.

B. Superstructure.

The after side of both port and starboard flag bags is dished to a depth of one inch. (Photo 1728-6, page 31).

The only other damage is scorching of the outer coat of paint on exposed vertical surfaces facing aft. Areas of most severe paint scorching are as follows:

- a. After bulkhead of Radio Central, starboard. (Photos 1728-4, 1849-6, pages 32 and 33).
- b. After starboard quarter of the stack. (Photo 1728-6, page 31).
- c. After side of 40 MM gun bulwarks at frame 135, starboard.
- d. After side of No. 4 mount. (Photo 1728-7, page 34).
- e. Canvas cover of line reel on fantail.
- f. Signal halyards and life lines.

C. Turrets, Guns and Directors.

No damage.

D. Torpedo Mounts, Depth Charge Gear.

No damage.

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E. Weather Deck.

No damage. Six deflection scratch gages located under the weather deck throughout the length of the ship recorded no movement.

F. Exterior Hull.

No damage.

G. Interior Compartments (above w.l.).

No damage except for a vent duct in (B-103-E).

H. Armor Decks and Miscellaneous Armor.

Not Applicable.

I. Interior Compartments (below w.l.).

No damage.

J. Underwater Hull.

No damage.

K. Tanks.

No damage.

L. Flooding.

None.

M. Ventilation.

Rivets failed in the vertical seam of a forward engineroom exhaust duct in the electrical workshop (B-103-E) at frame 112, starboard. The seam was made up with aluminum rivets and glue.

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N. Ship Control.

No damage.

O. Fire Control.

No damage.

P. Ammunition Behavior.

No damage.

Q. Ammunition Handling.

No damage.

R. Strength.

No damage.

S. Miscellaneous.

No comment.

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USS MUSTIN (DD413)

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TECHNICAL INSPECTION REPORT

SECTION II - MACHINERY

GENERAL SUMMARY OF MACHINERY DAMAGE

I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

No data taken by machinery group.

- (b) Structural damage.

No comment.

- (c) Other damage.

There was no damage to machinery during Test A.

II. Forces Evidenced and Effects Noted.

- (a) Heat.

No evidence.

- (b) Fires and explosions.

No evidence.

- (c) Shock.

No evidence.

- (d) Pressure.

No evidence.

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(e) Effects apparently peculiar to the atom bomb.

None.

III. Effects of Damage.

(a) Effect on machinery and ship control.

Test A, had no effect on machinery, and had no effect on ship control insofar as machinery is concerned.

(b) Effect on gunnery and fire control.

No comment.

(c) Effect on water-tight integrity and stability.

No comment.

(d) Effect on personnel and habitability.

Test A would have had no effect on personnel below decks. It had no effect on habitability insofar as machinery is concerned.

(e) Total effect on fighting efficiency.

None.

IV. General Summary.

The MUSTIN was outside the effective range of the explosion in Test A.

V. Preliminary Recommendation.

None.

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DETAILED DESCRIPTION OF MACHINERY DAMAGE

A. General Description of Machinery Damage.

(a) Overall condition.

The overall condition of the machinery of this vessel was not changed by Test A. The ship steamed for two hours at speeds up to 10 knots, operating engines both ahead and astern, on 7 July 1946. Operation was normal.

(b) Areas of major damage.

None.

(c) Primary cause of damage in each area of major damage.

Not Applicable.

(d) Effect of target test on overall operation of machinery plant.

The test had no effect on the overall operation of the machinery plant.

B. Boilers.

Undamaged. All boilers were steamed and tested hydrostatically after Test A, and show no change in condition.

C. Blowers.

Undamaged. The blowers have been operated under service conditions since Test A.

D. Fuel Oil Equipment.

Undamaged. This equipment has been in use while the ship was underway since Test A.

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E. Boiler Feedwater Equipment.

Undamaged. This equipment has been in use while the ship was underway after Test A. Performance was normal.

F. Main Propulsion Machinery.

1. Undamaged. The main engines were used underway at speeds of 10 knots, operating both ahead and astern, after Test A. Operation was normal.

2. Leads left in the bearings of the after low pressure turbine indicate that there was no motion of the rotor during the test. Readings of these leads before and after Test A, are identical, as follows:

Forward Bearing

Forward lead	.015
After lead	.017

After Bearing

Forward lead	.015
After lead	.015

G. Reduction Gears.

1. Undamaged.

2. The gears were inspected with inspection covers removed. All teeth are in good condition. Holding down bolts have been sounded and are tight. The gears have been in operation for five hours after Test A. During two hours of this time the ship was underway at speeds up to 10 knots. Operation was normal.

H. Shafting and Bearings.

Undamaged. The shaft and bearings operated normally while the ship was underway.

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I. Lubrication System.

Undamaged. The lubrication system was checked while the ship was underway after Test A. Operation was normal.

J. Condensers and Air Ejectors.

Undamaged. A vacuum of 28" was maintained while the ship was underway after Test A.

K. Pumps.

Undamaged. All pumps were operated under normal service conditions after Test A, and performed normally.

L. Auxiliary Generators (Turbines and Gears).

Undamaged. Generator #2 was operated under normal load after Test A, and performance was satisfactory. Generator #1 was inoperable before Test A. Its condition was not changed by the test.

M. Propellers.

Undamaged. The propellers were not accessible for visual inspection. They were checked while the ship was underway, and operated normally.

N. Distilling Plant.

Undamaged. The plant was operated after Test A. Quantity and quality of water distilled were normal.

O. Refrigeration Plant.

Undamaged. The plant has been in normal operation after Test A.

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P. Winches, Windlasses, and Capstans.

Undamaged. This machinery performed normally under service conditions after Test A.

Q. Steering Engine.

Undamaged. All steering machinery and controls were operated while the ship was underway after Test A. Operation was normal.

R. Elevators, Ammunition Hoists, Etc..

Undamaged. All ammunition hoists except #1 have been operated since Test A. No. 1 hoist was inoperable before Test A. Its condition was not changed by the test.

S. Ventilation (Machinery).

Undamaged. All ventilation machinery is in operation except the forward engine room exhaust blower which was inoperable before Test A. Its condition was not changed by the test.

T. Compressed Air Plant.

Undamaged. The high and low pressure compressors operated satisfactorily at normal pressures after Test A.

U. Diesels (Generators and Boats).

1. The emergency diesel generator is undamaged. It has been operated under load since Test A.

2. No boats were aboard during Test A.

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V. Piping Systems.

Undamaged. All piping has been subjected to normal operating pressures since Test A. All systems are satisfactory.

W. Miscellaneous.

Undamaged. All galley, laundry and machine shop equipment has been operating satisfactorily since Test A.

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USS MUSTIN (DD413)

TECHNICAL INSPECTION REPORT

SECTION III - ELECTRICAL

GENERAL SUMMARY OF ELECTRICAL DAMAGE

I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

Not observed.

- (b) Structural damage.

Not observed.

- (c) Other damage.

None.

II. Forces Evidenced and Effects Noted.

- (a) Heat.

The sole evidence of heat was the slight blistering of painted surfaces exposed directly to the blast. This blistering was not great enough to affect in any way the electrical cable and equipment exposed.

- (b) Fires and explosions.

There were no fires or explosions.

- (c) Shock.

There was no evidence of shock in any electrical equipment.

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(d) Pressure.

There is no evidence of pressure.

(e) Any effects apparently peculiar to the atom bomb.

None.

III. Effects of Damage.

(a) Effect on propulsion and ship control.

None.

(b) Effect on gunnery and fire control.

None.

(c) Effect on water-tight integrity and stability.

None.

(d) Effect on personnel and habitability.

None.

(e) Total effect on fighting efficiency.

None.

IV. General Summary of Observers' Impressions and Conclusions.

The vessel was located too far out from the point of explosion to receive sufficient damage.

V. Any Preliminary General or Specific Recommendations of the Inspecting Group.

No recommendations are made.

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DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

A. General Description of Electrical Damage.

(a) Overall condition.

No electrical damage.

(b) Areas of major damage.

None.

(c) Primary causes of damage in each area of major damage.

None.

(d) Effect of target test on overall operation of electric plant.

1. Ship's service generator plant - no damage.
2. Engine and boiler auxiliaries - no damage.
3. Electric propulsion - does not apply.
4. Communications - not affected.
5. Fire control circuits - no damage.
6. Ventilation - no damage.

(e) Types of equipment most affected.

None.

B. Electric Propulsion Rotating Equipment.

This item does not apply.

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C. Electric Propulsion Control Equipment.

This item does not apply.

D. Generators - Ships Service.

No damage.

E. Generators - Emergency.

No damage.

F. Switchboards, Distribution and Transfer Panels.

No damage.

G. Wiring, Wiring Equipment and Wireways.

No damage.

H. Transformers.

No damage.

I. Submarine Propelling Batteries.

This item does not apply.

J. Portable Batteries.

No damage.

K. Motors, Motor Generator Sets and Motor Controllers.

No damage.

L. Lighting Equipment.

No damage.

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M. Searchlights.

No damage.

N. Degaussing Equipment.

No damage.

O. Gyro Compass Equipment.

No damage.

P. Sound Powered Telephones.

No damage.

Q. Ship's Service Telephones.

This item does not apply.

R. Announcing Systems.

No damage.

S. Telegraphs.

No damage.

T. Indicating Systems.

No damage.

U. I.C. and A.C.O. Switchboards.

No damage.

V. F.C. Switchboard.

No damage.

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SECTION IV

PHOTOGRAPHS

TESTABLE

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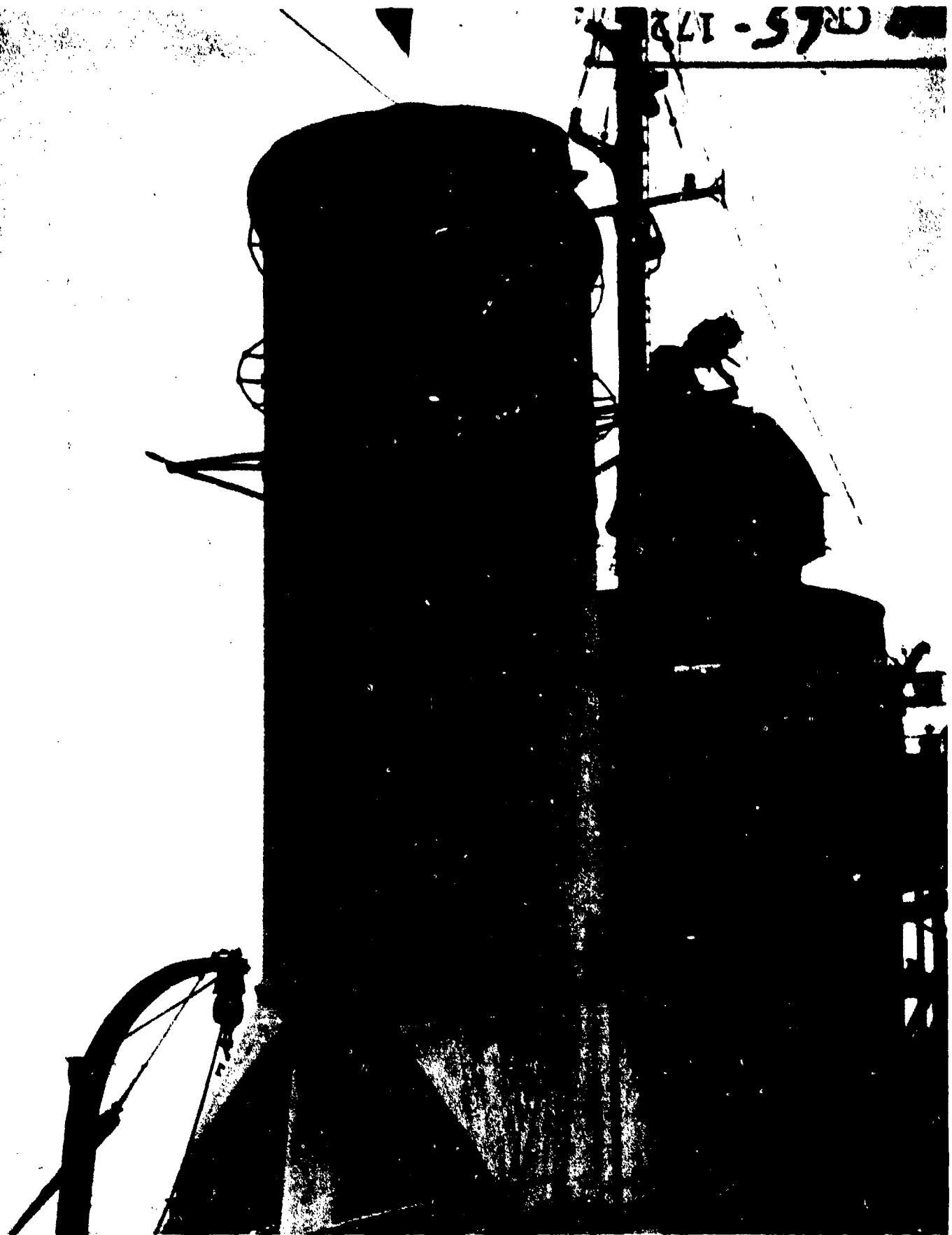
BA-CR-65-105-2. Close-up of superstructure, viewed from port beam.

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AA-CR-65-1728-6. Looking forward to superstructure showing damaged paint on stack.

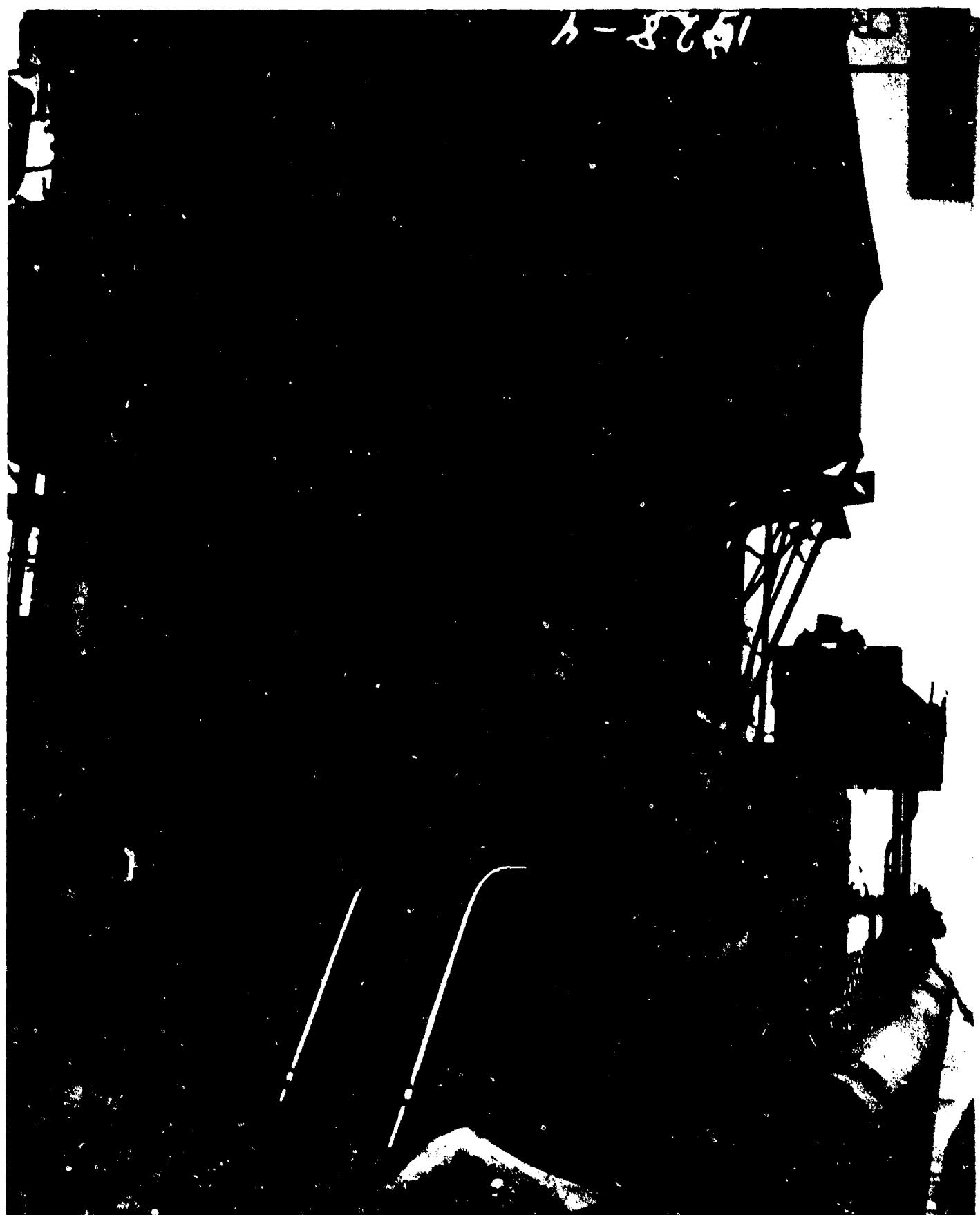
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AA-CR-65-1728-4. Looking forward along starboard side of superstructure showing paint damage on transverse bulkheads facing aft.

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ACR-65-1849-6

AA-CR-65-1849-6. Blistered paint on after bulkhead of radio central.

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AA-CR-65-1728-7. Paint damage on after face of #4 mount.

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APPENDIX

COMMANDING OFFICERS REPORT

TEST ABLE

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REPORT #11
COMMANDING OFFICER'S REPORT
SECTION I

The U.S.S. MUSTIN (DD413) is a 1570 ton destroyer of the HUGHES class, built at Newport News, Virginia, and first commissioned on 15 September 1939.

For test ABLE the MUSTIN was located 1850 yards, bearing 111° true from the U.S.S. NEVADA.

Considering the age of this vessel and the limited and inexperienced personnel available for upkeep and maintenance during the past six or eight months, the ship was in very good material condition for Test A. The trip from Pearl Harbor to Bikini was made with no material casualties whatsoever. All machinery, with the exception of the Distilling Condenser Condensate and Cooling Pump, which was on the U.S.S. DIXIE for repairs, was operable. All fire control and electronic equipment was operable.

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REPORT #11
COMMANDING OFFICER'S REPORT
PART A - GENERAL SUMMARY

I. Target Condition After Test.

(a) There was no change in draft after the test. There was no list and there was no flooding.

(b) There was no major structural damage. Minor damage of interest consisted of the splitting of the sheet aluminum protective bulkhead of the exhaust blower from the forward engine room. This bulkhead is located in the electric shop (Compt. B-104) at frame 112, starboard side. It is secured with aluminum rivets and glue.

The after side of both port and starboard flag-bags were slightly dished in to a depth of approximately one (1) inch.

(c) All machinery, ship control, fire control, gunnery, electrical and electronics equipment is operable. The MUSTIN was underway for about two hours on 7 July while shifting berths. A speed of ten (10) knots was made and all main propelling machinery and ship control was in satisfactory operating condition.

(d) The only evidence of heat was a very slight scorching of the paint, most noticeable on the starboard side of the superstructure deck forward. There was no evidence of fires on board.

It is estimated that from heat there would have been no casualties providing personnel were fully clothed. The blast effect seems to have been moderate insofar as personnel is concerned, and it is believed that no serious injuries would have resulted.

II. Forces Evidenced and Effects Noted.

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(a) The heat or scorching effect extended from No. 4 gun mount to the bridge on the starboard side. There was not a continuous evidence of scorching however. The most noticeable area of scorching was on the starboard after corner of the forward superstructure decks from the forecastle deck level to the bridge level. Penetration was through one (1) thickness of paint.

It appears that the direction of the heat and blast came from between fifteen and twenty-five degrees off the starboard quarter.

(b) No evidence of fires or explosions.

(c) No evidence of shock other than as described in paragraph I(b) above.

(d) The apparent direction of the blast appears to be from fifteen to twenty-five degrees off the starboard quarter.

(e) No effects which might be attributed as peculiar to the atom bomb were noted.

III. Results of Test on Target.

(a) There was no effect on propulsion or ship control.

(b) There was no effect on gunnery or fire control.

(c) There was no effect on water-tight integrity or stability.

(d) Except for the results of intense radioactivity, which may or may not have been applicable to this ship on this particular test, the effect on personnel would have been as described in paragraph I(d) above, ie., nil.

The ship was completely habitable.

(e) It is believed that the effect on the fighting efficiency of this ship would have been negligible.

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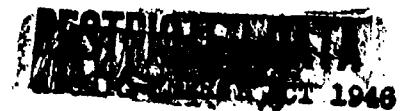
USS MUSTIN (DD413)

If the exposed topside personnel of this vessel had been properly and fully clothed, including dark protective sun glasses, the fighting efficiency of this ship would not have been impaired. However, it is possible that the psychological effect of an explosion of the magnitude and intensity of the atom bomb, might very well impair the mental process of those that witness it at close hand for some few minutes.

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By Authority of Joint Chiefs of Staff (Action 15 Apr 49)
By *John D. Laffey* Date *24 Jan 51*
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Defense Special Weapons Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

TRC

18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

/ ✓ AD-366588 ✓	XRD-203-Section 12 ✓
✗ — AD-366589 ✓	XRD-200-Section 9 ✓
AD-366590 ✓	XRD-204-Section 13 ✓
AD-366591 ✓	XRD-183 ✓
/ ✓ AD-366586 ✗	XRD-201-Section 10 ✓
✓ ✓ AD-367487 ✗	XRD-131-Volume 2 ✓
✓ ✓ AD-367516 ✗	XRD-143 ✓
✓ ✓ AD-367493 ✗	XRD-142 ✓
AD-801410L ✓	XRD-138 ✓
AD-376831L ✓	XRD-83 ✓
AD-366759 ✗	XRD-80 ✓
✓ ✓ AD-376830L ✗	XRD-79 ✓
✓ ✓ AD-376828L ✗	XRD-76 ✓
✓ ✓ AD-367464 ✗	XRD-106 ✓
AD-801404L ✓	XRD-105-Volume 1 ✓
✓ ✓ AD-367459 ✗	XRD-100 ✓

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AD-376836L✓	XRD-98✓
AD-376835L✓	XRD-97✓
AD-376834L✓	XRD-96✓
AD-376833L✓	XRD-95✓
✓ AD-376832L✓	XRD-94✓ re-ingest
✓ AD-367458X	XRD-93✓
AD-367457✓	XRD-92-Volume 2✓
AD-367456✓	XRD-91-Volume 1✓
AD-367455✓	XRD-90✓
AD-367454✓	XRD-89✓
AD-367453✓	XRD-88✓
AD-367452✓	XRD-87✓
AD-366764✓	XRD-86✓
AD-376837L✓	XRD-99
AD-366758✓	XRD-78✓
AD-366734✓	XRD-44✓
AD-366763✓	XRD-85✓
AD-376829L✓	XRD-77✓
✓✓ AD-367462 X	XRD-103✓
✓✓ AD-367463 X	XRD-104✓
✓✓ AD-367461 X	XRD-102✓
AD-367460✓	XRD-101✓

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AD-801406L ✓ XRD-114✓

In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

Ardith Jarrett
ARDITH JARRETT
Chief, Technical Resource Center